(12) UK Patent Application (19) GB (11) 2 231 808 (13) A

(43) Date of A publication 28.11.1990

(21) Application No 9009927.6

(22) Date of filing 02.05.1990

(30) Priority data

(31) 8911450	(32) 18.05.1989	(33) GB
8915704	08.07.1989	
8922450	05.10.1989	
8926513	23.11.1989	

(71) Applicant
Spectrum Arts Limited

(incorporated in the United Kingdom)

24 Lancaster Avenue, Ramsbottom, Lancashire, BL2 9QA, United Kingdom

(72) Inventor
John Graham Hassall

(74) Agent and/or Address for Service
Mewburn Ellis
Hollins Chambers, 64a Bridge Street, Manchester, M3 3BA, United Kingdom

(51) INT CL[5]
A63F 9/12 // A63H 33/04, G09B 27/08

(52) UK CL (Edition K)
A6H H12A
G5G G1
U1S S1205

(56) Documents cited

GB 2219216 A	GB 2157962 A	GB 2139512 A
GB 1176962 A	US 3865382 A	US 3704829 A
US 3578331 A		

(58) Field of search
UK CL (Edition K) A6H H12A
INT CL[5] A63F

(54) Jigsaw puzzles

(57) Three-dimensional jigsaw puzzle assemblies are predominantly of sheet form so as to provide a hollow shell, or an outer layer over a supporting substrate. In some embodiments the individual pieces are curved, and assembled shapes such as cylinder or spheres can be formed from these. Other irregular shaped objects can also be formed e.g. tea pot, bear, cup, house. The pieces may have conventional interengageable tabs 12 and recesses 13 (the latter optionally being in the form of shallow pits), and where these pieces are required to be self supporting when assembled, additional means such as plugs 14 and apertures 15 may be provided for more secure interengagement. As shown, a globe is formed by pieces secured to a spherical support by barbed fastener material 124. Other fastening means could be adhesive, magnets, press studs or bristles. The tabs may be resilient (Fig 31) and squeezed into the recesses.

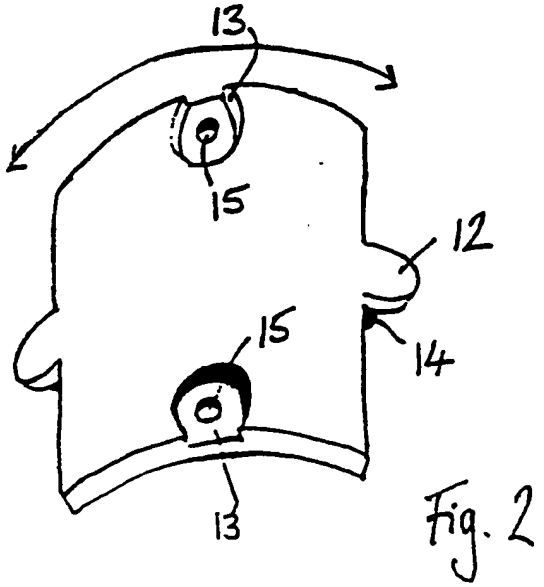
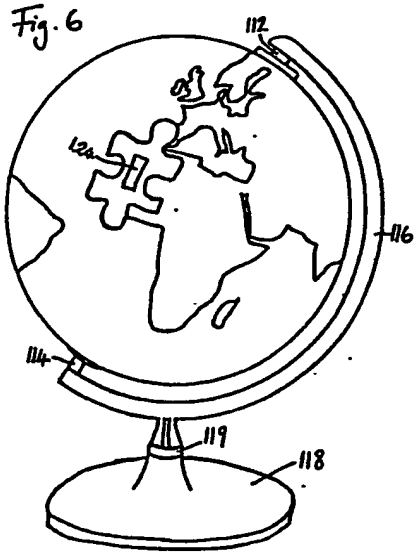


Fig. 2

Fig. 6



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

GB 2 231 808 A

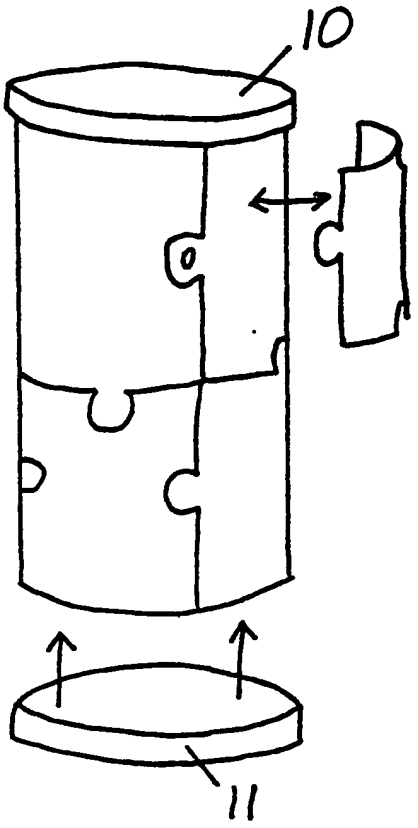


Fig. 1

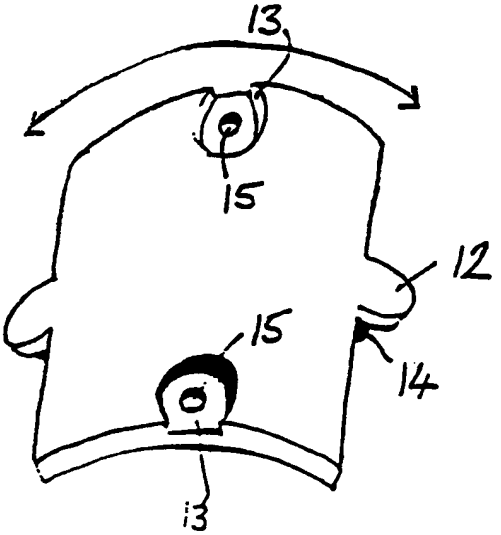


Fig. 2

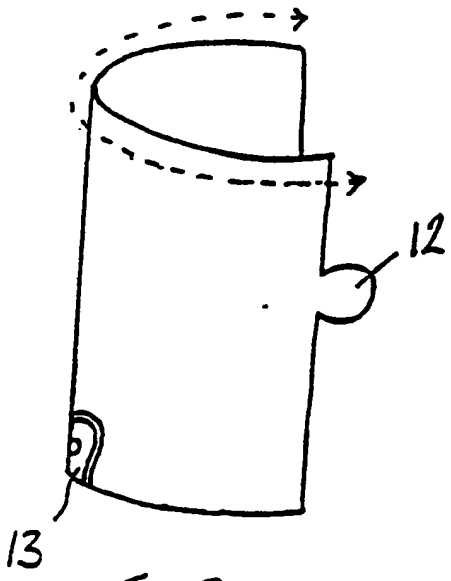


Fig. 3

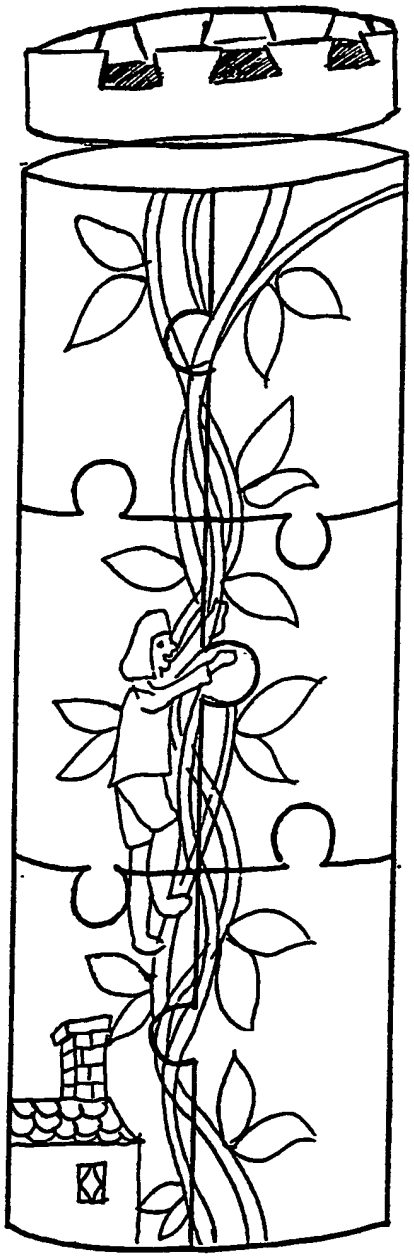


Fig. 4

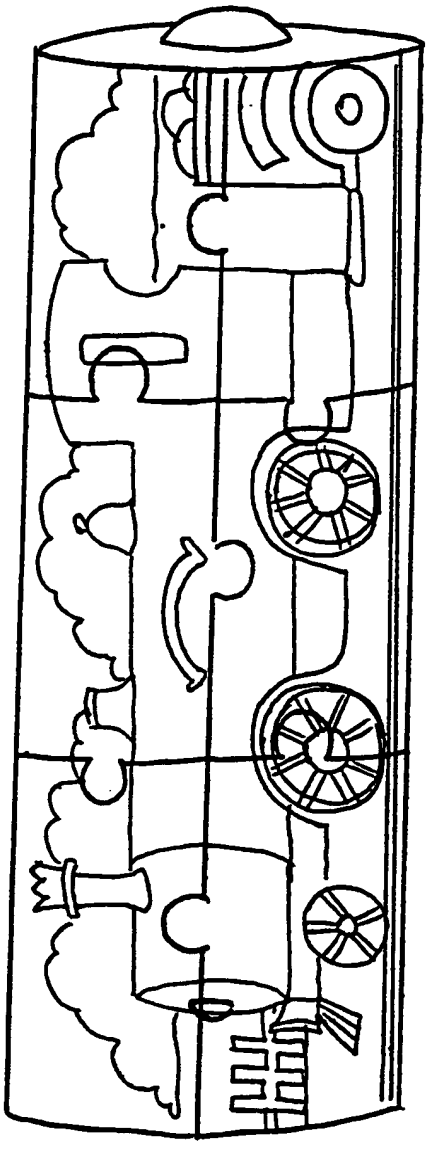


Fig. 5

Fig. 6

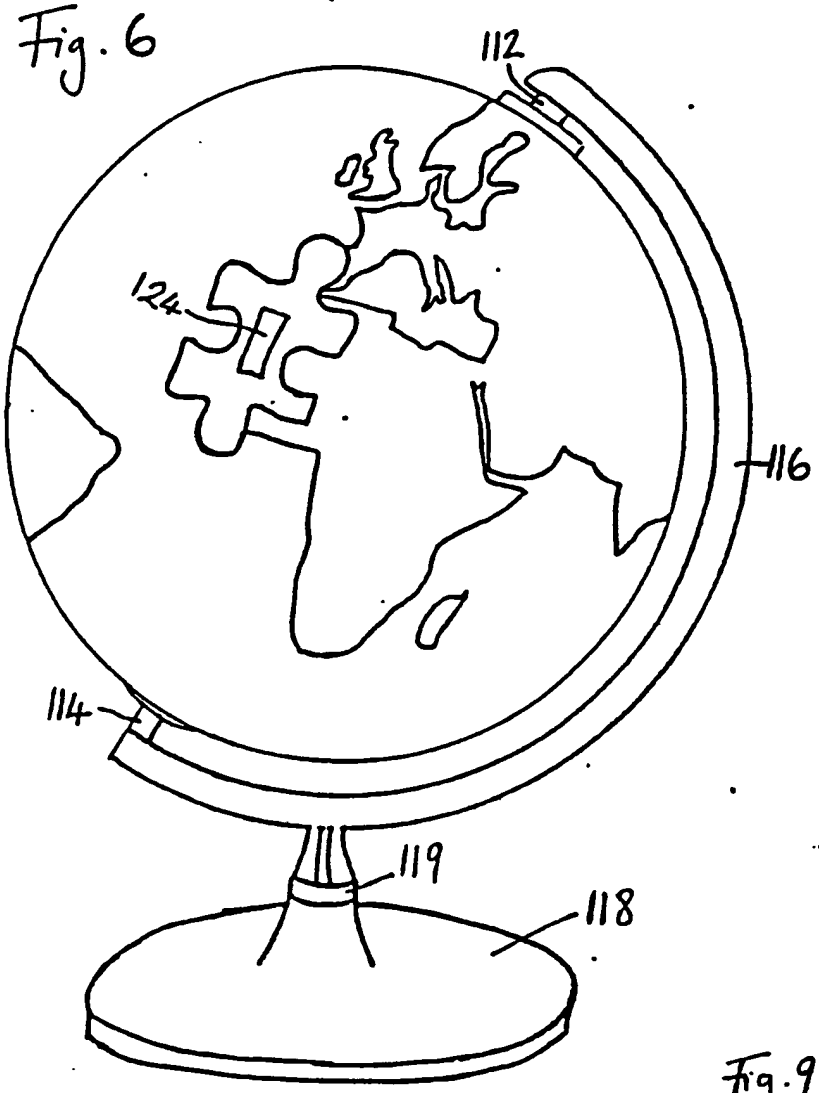


Fig. 7

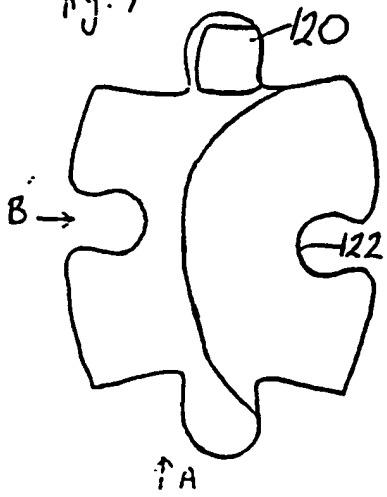


Fig. 8

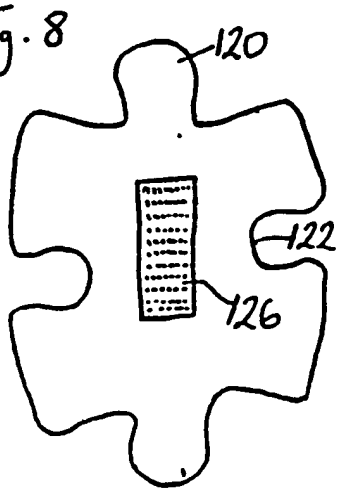
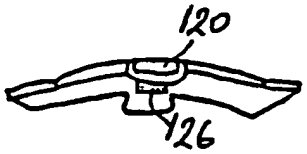


Fig. 9



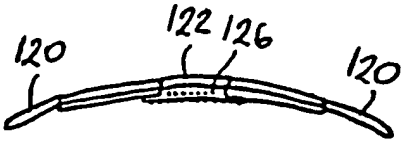


Fig. 10

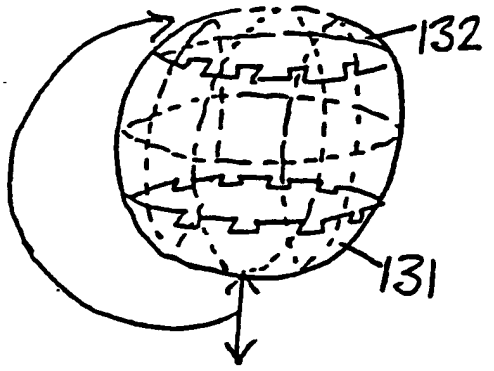


Fig. 11

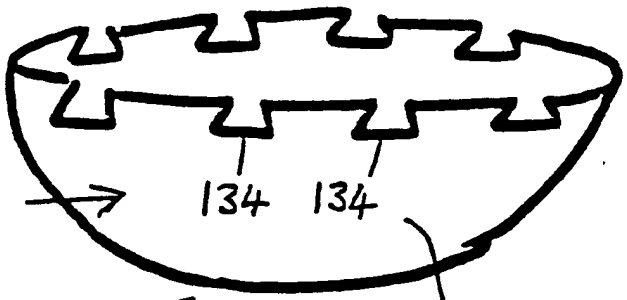


Fig. 12a

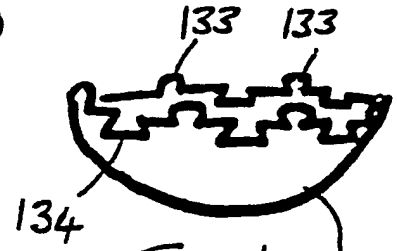


Fig. 12b

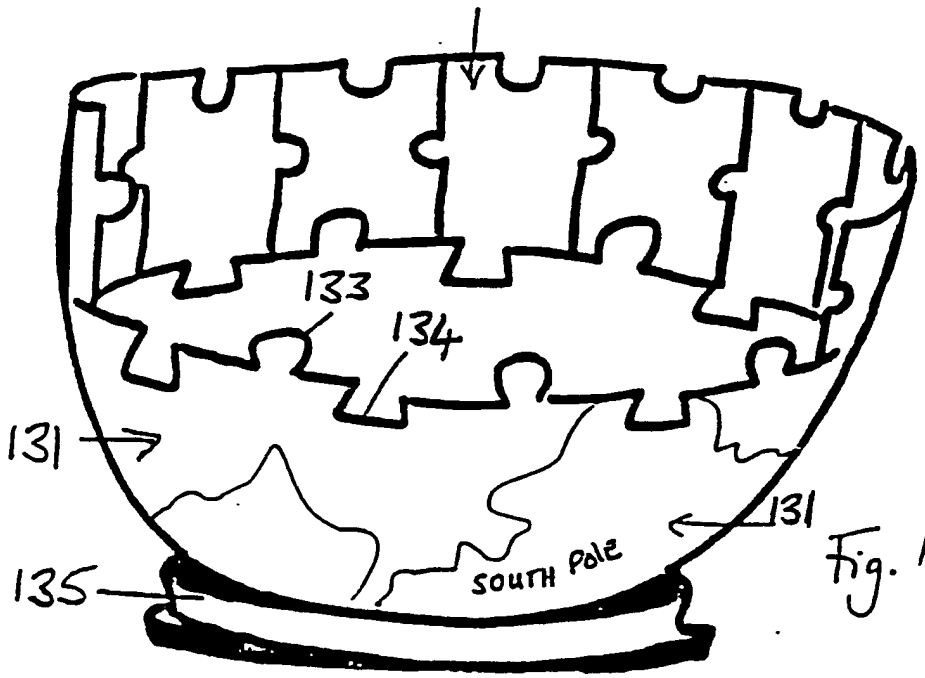


Fig. 13

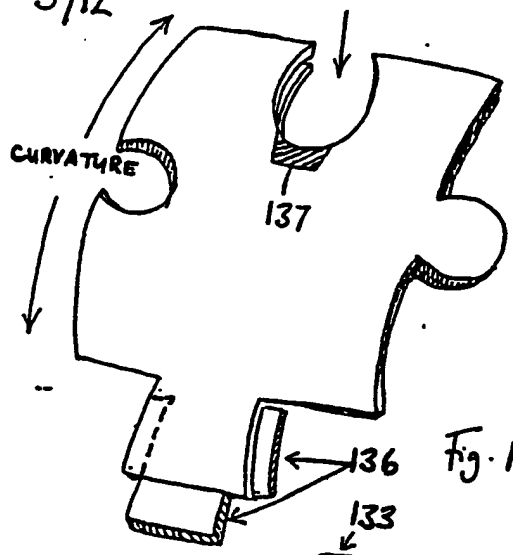


Fig. 14

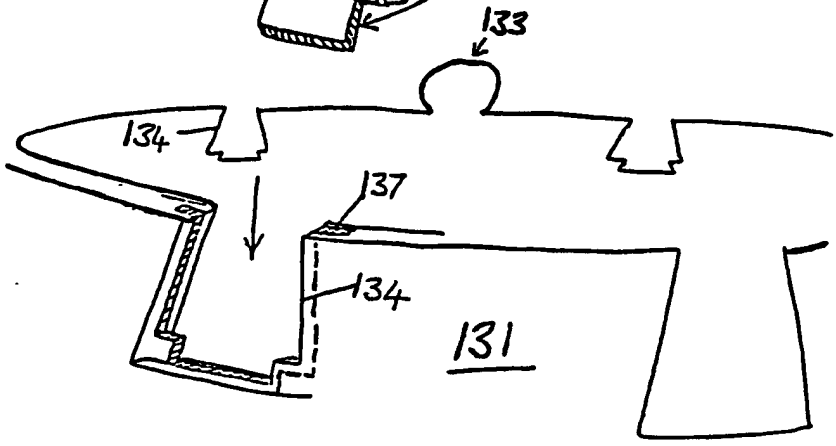


Fig. 15

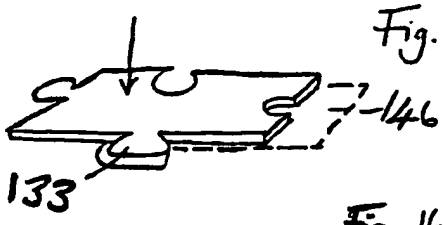
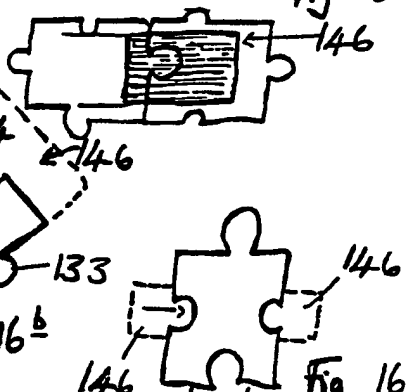


Fig. 16a



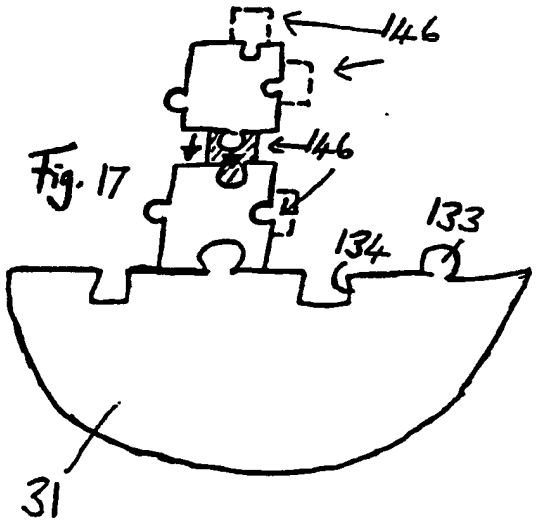


Fig. 17

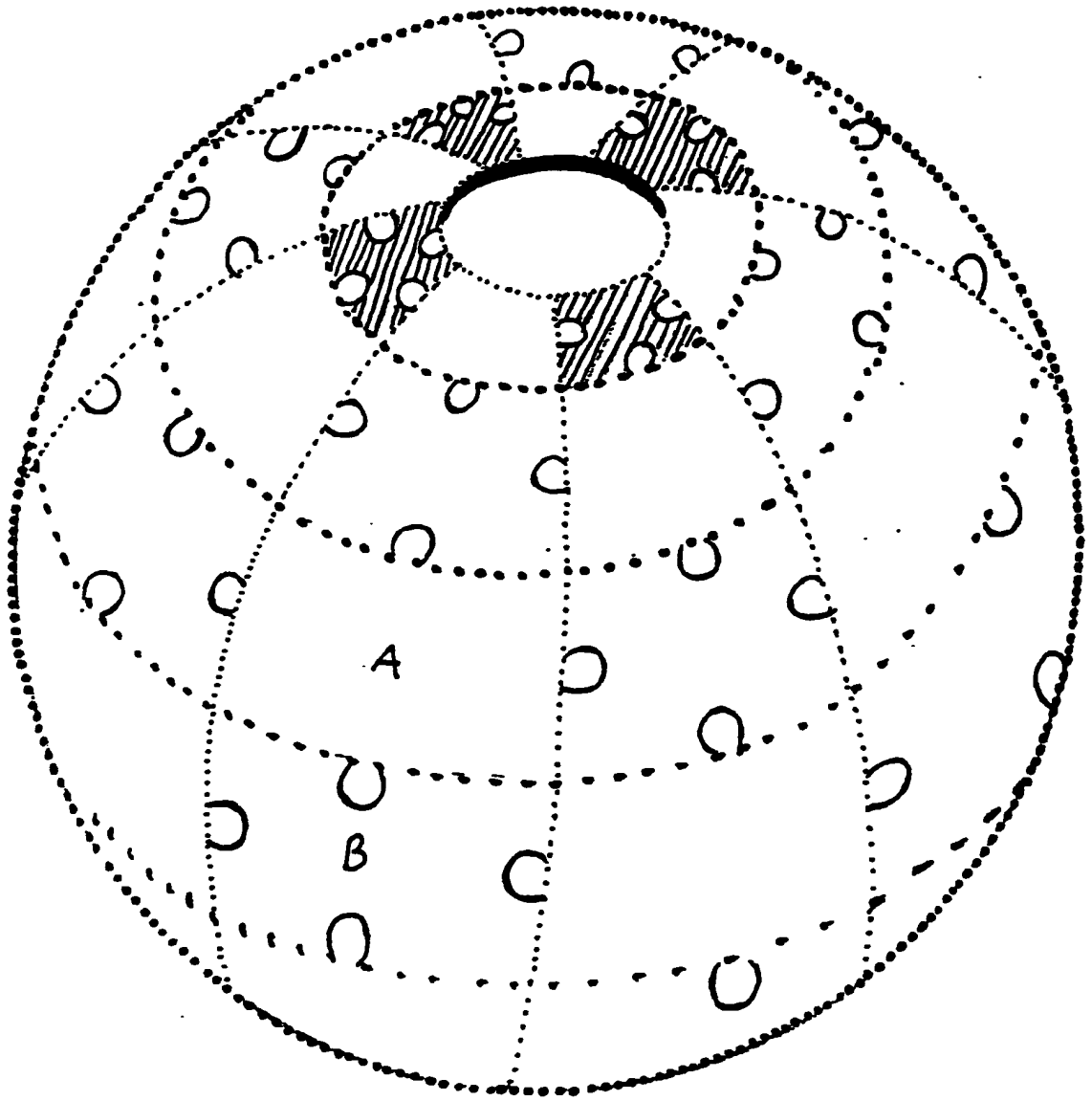


Fig. 18

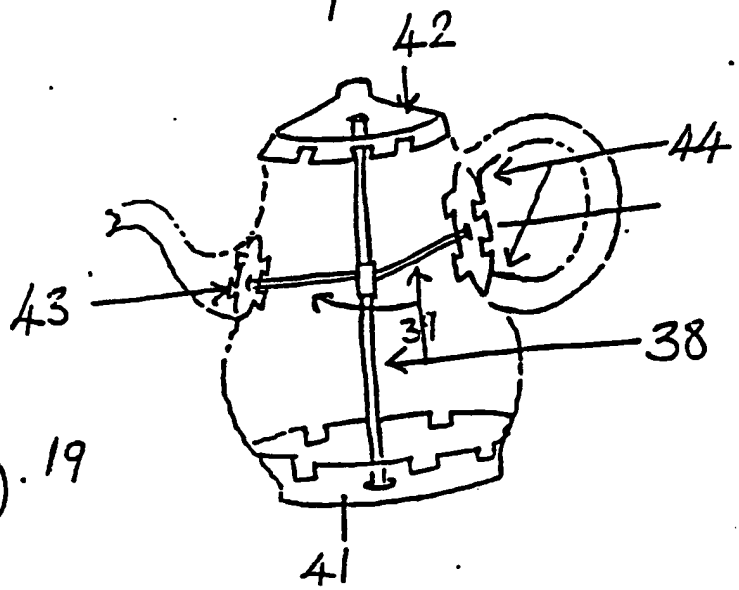


Fig. 19

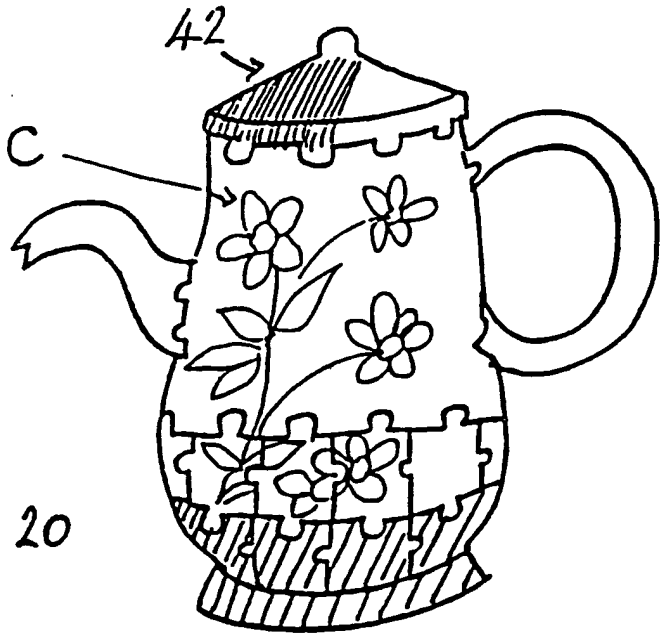
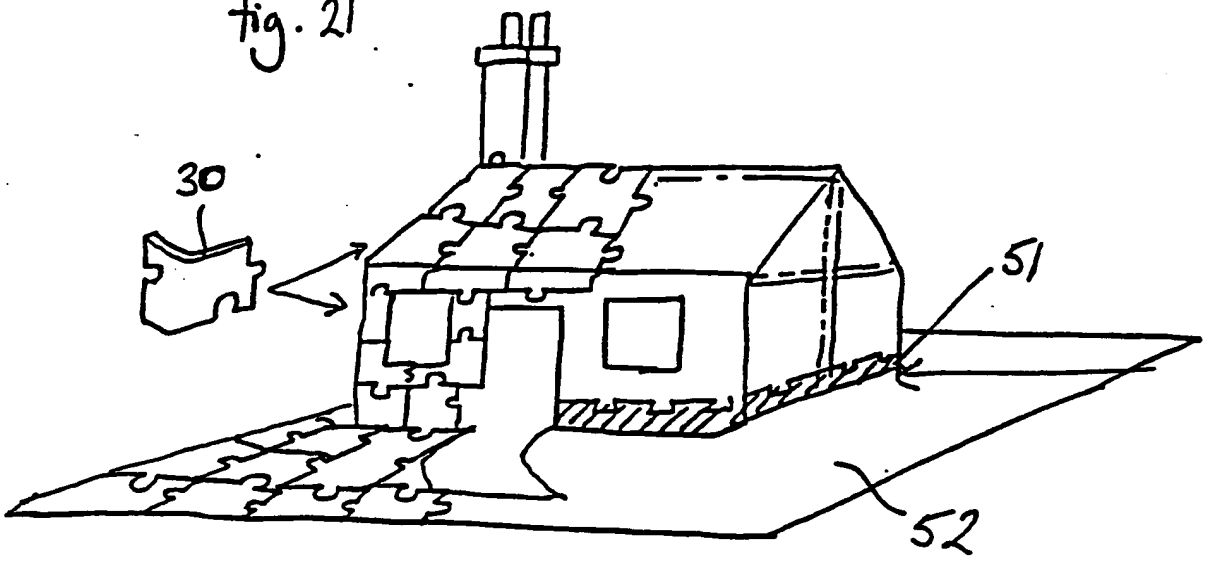


Fig. 20

Fig. 21



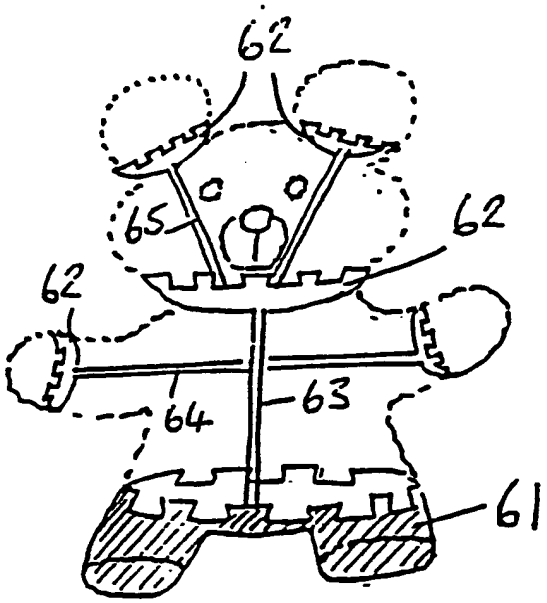


Fig. 22

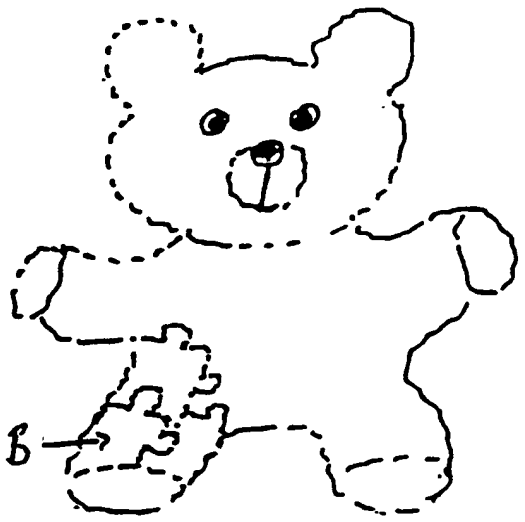


Fig. 23

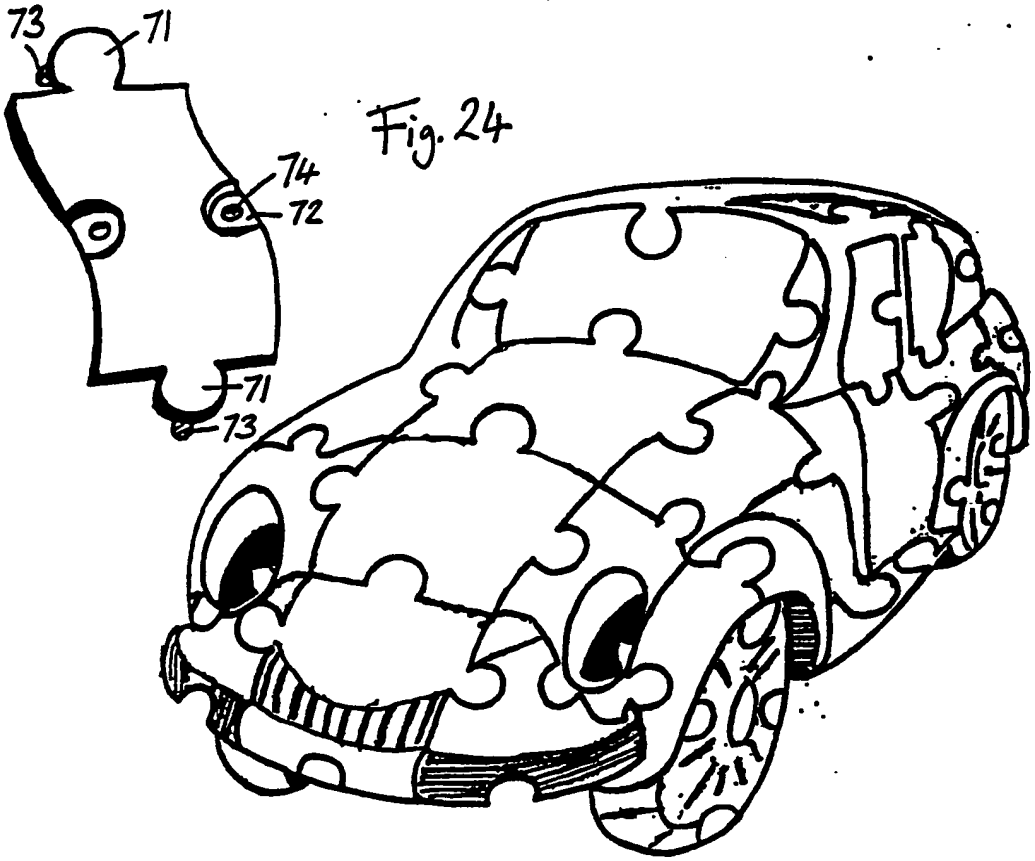


Fig. 24

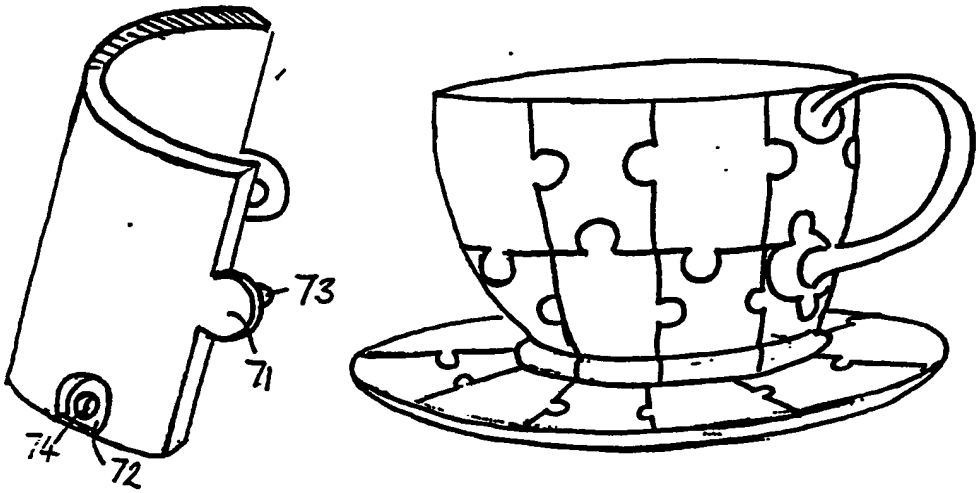


Fig. 25

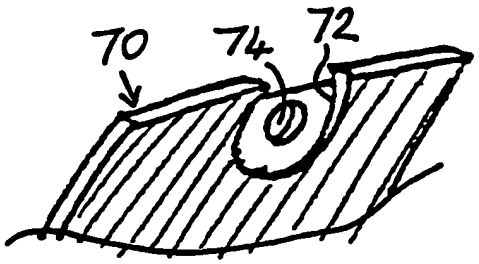


Fig. 26

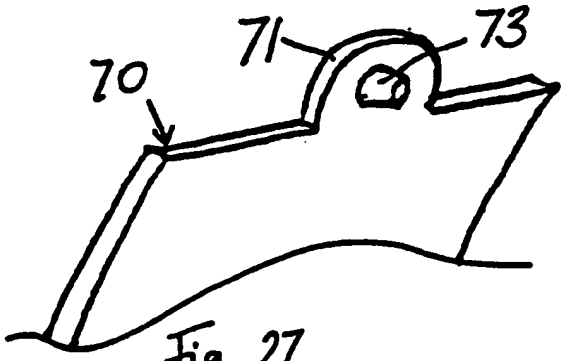


Fig. 27

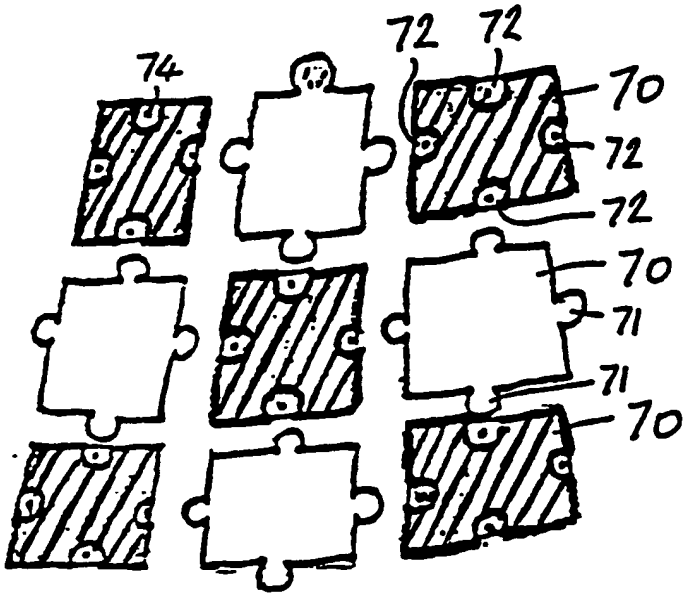


Fig. 28

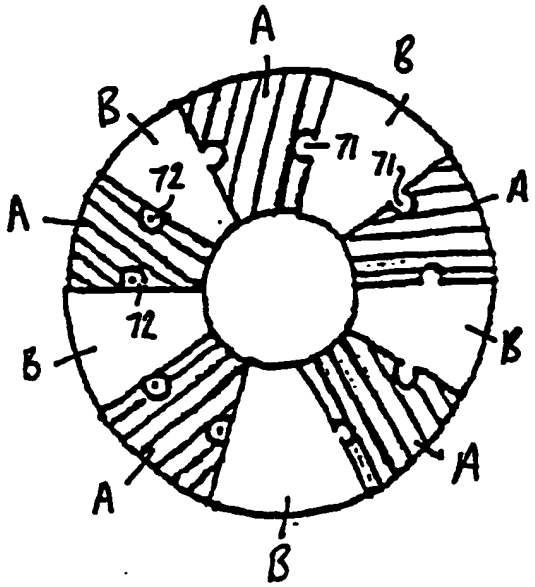


Fig. 29

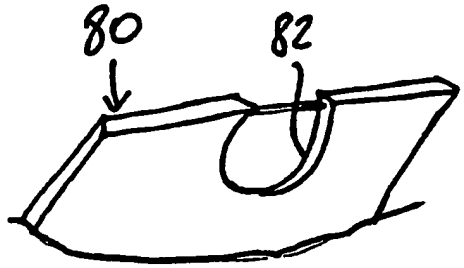


Fig. 30

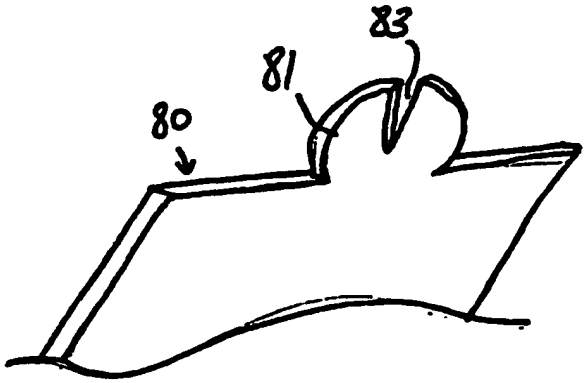


Fig. 31

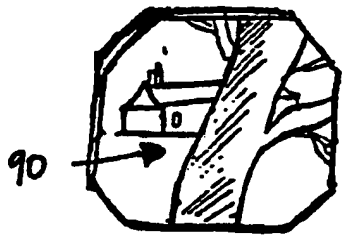


Fig. 32

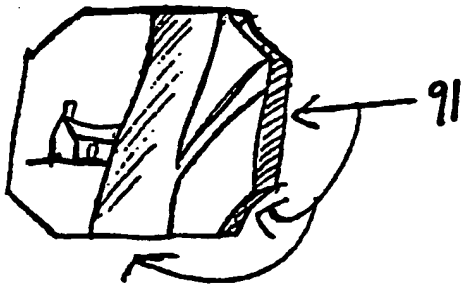


Fig. 33

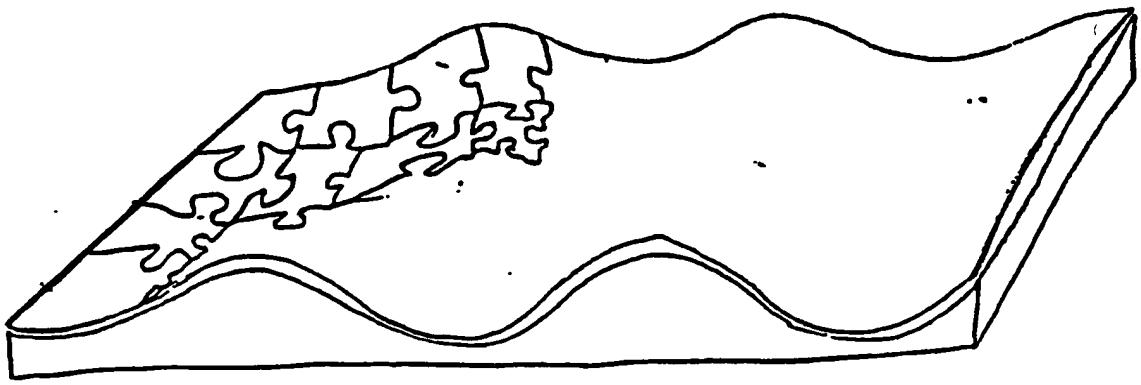


Fig. 34

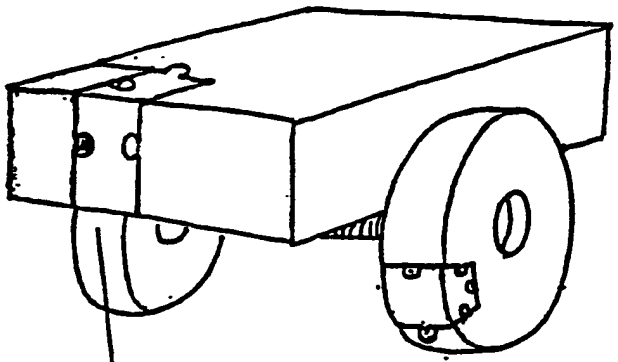


Fig. 35

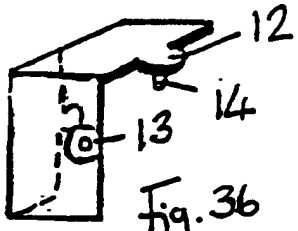


Fig. 36

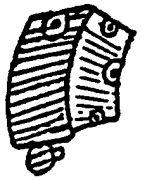


Fig. 37

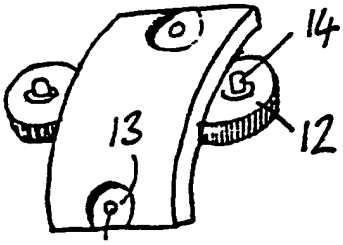


Fig. 38

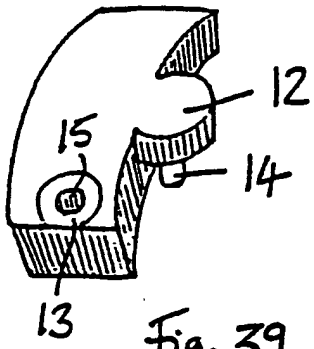


Fig. 39

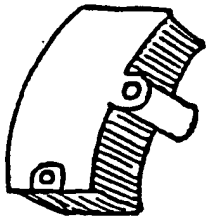


Fig. 40



Fig. 42



Fig. 41

IMPROVEMENTS IN JIGSAW PUZZLES

This invention relates to improvements in jigsaw puzzles, which for present purposes are defined as interfitting (usually interlocking) pieces of stiff material usually carrying surface indicia which form a picture when the pieces are fitted together.

Jigsaw puzzles are well known in the art and they are assembled for amusement or intellectual exercise, often as an educational tool for children who become used to recognising the interlocking shapes of the depicted picture and/or the individual pieces.

Conventionally jigsaw pieces and assembled puzzles have been two dimensional, i.e. flat - since they have been intended for assembly on flat substrates, such as table tops or special boards - and they have always had smooth upper indicia-carrying surfaces.

According to the present invention, a jigsaw puzzle assembly is now proposed wherein a plurality of pieces are adapted to fit together to provide a three-dimensional structure, at least some of the pieces providing the contour or shell of the structure being of sheet-form.

Within this general concept, several inovatory aspects of jigsaw puzzle construction are proposed.

Firstly, the individual pieces, or at least some of them, may be curved in at least one direction.

Secondly, the assembly may include a support element upon which the individual pieces are supported as they are assembled. In this respect, the support element may, on the one hand, take the form of a basal element, with which only the lowermost pieces make edge contact, as the pieces are assembled upwardly therefrom. On the other hand, the support element may take the form of an underlying support with which the major underfaces of the pieces make contact. A combination of the two forms of support would also be possible.

Thus, an assembled three-dimensional jigsaw in accordance with the invention may comprise a substantially self-supporting shell formed solely of a plurality of individual pieces (i.e. without a discrete support element), or of a basal support element upon which a plurality of individual pieces have been assembled. Alternatively, the pieces may be assembled as an outer layer or shell overlying a supporting surface.

The above mentioned aspects of curvature and support may be combined. When individual pieces are curved, the support element, whether baseal or generally underlying may also be curving (or undulating) in a matching or corresponding manner. Such curvature may be in one direction, or in two directions.

Two particular styles of puzzle assembly in accordance with the invention, which include curving pieces, deserve special attention. The first of these is a puzzle which in the assembled condition has a cylindrical outer contour, and the second of these is a puzzle which in the assembled condition has a spherical outer contour.

Of course there are variations, such as an assembled puzzle of hemispherical outer contour, and other possibilities such as puzzles with generally undulating contours, or irregularly curving contours to form recognisable shapes such as a teapot, a toy bear, a cup and saucer, or puzzles which combine curving and/or straight and/or angular contours to form shapes such as cars and houses etc.

Numerous alternative manners of interconnection between respective pieces, and between pieces and support elements (if provided) are proposed, many of

these involving interengaging tabs and recesses, with or without additional means such as interchangeable apertures and plugs on these tabs and recesses (or vice versa), in the case of self-supporting puzzles, and such as adhesive or magnetic means in the case of puzzles where the pieces have an underlying support element.

The invention may be better understood by reference to the accompanying drawings, and numerous other developments and features within the scope of the invention will emerge from the detailed description which follows therefrom. In the drawings:

Fig.1 is a rough persepctive view of a hollow, cylindrical, self-supporting puzzle, with end caps, for use as a money box;

Fig.2 is an enlarged perspective view of one piece from the puzzle of Fig. 1, shown from one end;

Fig.3 is a side view of the same piece;

Fig.4 is a perspective view of a practical embodiment of a cylindrical puzzle;

Fig.5 is a similar view of another practical embodiment of cylindrical puzzle;

Fig.6 is a perspective view of a practical embodiment of a spherical jigsaw puzzle

assembly in accordance with the invention; with one piece removed;

Fig.7 is an enlarged view of the piece removed from the puzzle shown in Fig. 6;

Fig.8 is an underside view of the piece shown in Fig. 7;

Fig.9 is a side view of the piece shown in Fig. 7 in the direction of arrow A in Fig. 7;

Fig.10 is a side view of the same piece in the direction of arrow B in Fig. 7;

Fig.11 is a schematic perspective view of another embodiment of spherical puzzle in accordance with the invention;

Figs.12a and 12b are schematic enlarged views of alternative styles of basal/top elements for the Fig. 11 embodiment;

Fig.13 is an enlarged view of the partially assembled Fig.11 embodiment;

Fig.14 is a much enlarged fragmentary perspective view illustrating the manner of assembly and the optional additional lugs and grooves of the Fig.11 embodiment;

Fig.15 is a perspective view of a single piece in a modified version of Fig.11;

Fig.16 a, b and c are plan views of a single and two adjoining such pieces; and

Fig.17 is a fragmentary schematic view showing use

of such pieces in a modified version of the Fig.11 embodiment;

Fig.18 is a schematic persepctive view of another embodiment of spherical puzzle in accordance with the invention;

Fig.19 is a schematic view of another embodiment of three dimensional puzzle in accordance with the invention, showing the internal support thereof;

Fig.20 is an enlarged view of the exterior of the fully assembled puzzle of Fig.19;

Fig.21 is a schematic view of another embodiment, partially assembled;

Fig.22 is a schematic view of another embodiment, again showing the internal support thereof;

Fig.23 is an exterior view of the fully assembled puzzled of Fig.22;

Fig.24 is a schematic view of another embodiment, assembled, along with an enlarged detail of a single piece;

Fig.25 is similarly a schematic view of another embodiment, assembled, along with an enlarged details of a single piece;

Figs.26 and 27 are fragmentary perspective views of recess and projection portions of respective pieces, designed to be fitted together, in accordance with selected

embodiments of the present invention;

Fig.28 is a frontal view, to a reduced scale, of nine pieces, of similar design, which are laid out in the manner in which they are to be connected together;

Fig.29 is a plan view illustrating how pieces of such design can be fitted together in a spherical assembly;

Figs.30 and 31 are fragmentary perspective views of recess and projection portions of respective pieces which are designed in another manner to be fitted together;

Figs.32 and 33 are front and perspective views of other styles of pieces which could be used in selected embodiments of the present invention;

Fig.34 is an incomplete perspective view of another embodiment, namely a jigsaw puzzle assembly of undulating form, in accordance with the invention;

Fig.35 is a schematic perspective view of a wheeled unit, showing how different types of pieces may be assembled into such a unit;

Figs.36 and 37 are enlarged perspective view of two such pieces, namely a leaf-form angled piece and a block-form curved piece;

Figs.38, 39 and 40 are persepctive views of other

types of pieces which might be used in three-dimensional units comparable to Fig.35, or three-dimensional configurations as shown in Fig.41;

Fig.41 is a reduced scale schematic perspective view of a third style of puzzle, which is self-supporting and of irregular shape; and

Fig.42 is an enlarged perspective view of a single piece which might be used in an assembly as shown in Fig.41, and which is both curved in one direction, and angled and has one projection extending at an oblique angle from the angled portion.

Referring, first of all, generally to Figs. 1 to 5, particularly simple and attractive embodiments in accordance with the invention are of cylindrical form, i.e. cylindrical external contour when fully assembled.

Some embodiments may be hollow and self-supporting (i.e without any support element) and made up of pieces which are curved in one direction only. These pieces may be interconnected by interengaging projections and recesses and/or other attachment means of any of the types which will be described hereinafter.

Alternative embodiments may also comprise pieces

curved in one direction only, but supported on a hollow cylindrical support element, and optionally retained by adhesive or magnetic means etc. in addition to interengagement of projections and recesses.

Other embodiments may be at least partially of solid form, either having some pieces in the form of wedge-shaped blocks (also with attachment means, such as interengaging recesses and projections, and/or adhesive or magnetic means) or sheet form pieces overlying a solid support element.

In any of these forms, end caps may be provided, and may usefully enhance the rigidity of the completed assembly, which in most cases will be capable of standing stably on one end.

The individual pieces may be cut or moulded of any suitable material. For example, they may be moulded or stamped out of coloured plastics (red, green, blue, yellow etc.) so that further pictorial matter on the outer surface is not necessary. Alternatively, the outer surfaces of the individual pieces (made from any material) may have pictorial matter or indicia applied by individual transfers, or by hand painting.

Obviously there are numberous possibilities for the

sort of suitable pictorial matter or indicia which might be applied when this type of cylindrical puzzle is to be used as an educational toy. Screen printing or litho printing may be used to print design either onto individual pieces or onto the part assembled or full assembled puzzle.

Where the puzzle is of hollow form, it may have some other practical application, e.g. with or without end caps it may be used for storage of rolled posters or other documents, with end caps it may be used as a money box, with suitable external pictorial matter.

Numerous other possibilities exist where only a portion of the puzzle is cylindrical, or where the same principles are applied to other comparable shapes e.g. prisms of rectangular or triangular or oval cross-section.

Figs.1 to 3 show the use of respective end caps 10, 11 on a hollow cylindrical puzzle so as to form an enclosure, used, for example, as a money box. The pieces have interengaging projections 12 and recesses (shallow pits) 13 provided with interengaging plugs 14 and apertures 15 for extra security. However any other suitable manner of interconnection could alternatively be used.

Although Fig.1 shows a device made of six or eight pieces, each with the same curvature in one direction, it will be obvious that a much longer device can readily be constructed from additional pieces, and more pieces could be used circumferentially in other embodiments. For example, cylindrical form puzzles from less than 10cm up to more than 3m can be envisaged constructed on the same principle.

Indeed Figs.4 and 5 show longer cylindrical form puzzles formed from a larger number of pieces, bearing attractive surface pictorial matter. These have end caps at the top, and may have at the bottom, either releasable end caps or integral end closures on a hollow supporting element. They can be used as money boxes or attractive containers.

Turning now to consider Figs.6 to 18, these illustrate various embodiments, in accordance with the invention, of spherical form, i.e. spherical external contour when fully assembled.

With reference to Figs.6 to 10, the first example is of a spherical jigsaw puzzle assembly in the form of a globe, that is to say having a map of the world printed onto the visible surface provided by the interfitting pieces of the puzzle. A supporting element

is provided in the form of a hollow sphere of any suitable material, e.g. plastics, synthetic rubber, metal, which is rotatably supported at opposing poles by axial bearings 112, 114. In conventional manner the bearings 112, 114, are mounted near the ends of an arcuate strip 116, which is rigidly mounted on a circular base plate 118, by way of a pedestal 119.

The jigsaw pieces, which are not individually depicted in Fig.6, are intended to be applied to the surface of the supporting sphere in appropriate interfitting arrangement so that their adjoining surface correctly depicts the world map. The pieces are curved, in fact part-spherical, as best shown in Figs. 9 and 10, so as to closely overlie relevant portions of the spherical surface of the support element, as well as being provided with tabs 120 and recesses 122 of conventional form for mutual interengagement.

The pieces, in this example, are releasably secured to the spherical support by small patches of barbed fastener material (Registered Trade Mark Velcro) 124, 126 which are spaced at appropriate places over the surface of the spherical support and located on the underside of each of the pieces, respectively. Thus each piece is simply pressed into place on the support, the Velcro 126 on its underside attaching itself to the

relevant Velcro patch 124 on the surface of the support. In this respect, in Fig.6, where a piece has been removed, the Velcro patch 124 on the surface, corresponding to the middle region of the piece, is exposed, while the Velcro patch 126 on the underside of the piece is shown in Fig.8.

To achieve the appropriate curving, part-spherical shape, the pieces may either be moulded from plastics, or cut from spherical or hemispherical blanks of plastics or cardboard, onto which the surface decoration, in this case the map, has already been printed.

It will be appreciated that the aforesaid example will have application as an education tool to impart geographic knowlege.

The manner by which the pieces are releasably attached to the spherical support surface may vary, and there are many possibilities. For example special readily releasable adhesive, which does not rapidly lose its adhesive properties, may be applied to the support surface, and a relase film may then be provided as a cover, during storage, when the the pieces are not in place, to avoid unwanted adhesion of other items. Alternatively attachment by magnetic means can be

envisaged, perhaps with small magnets on the underside of each piece and the support either formed in its entirety of magnetic material, e.g. sheet steel, or having pieces thereof mounted at appropriate places (just as the Velcro patches). The converse is equally possible with the magnets on the support and the magnetic material on the pieces.

Yet a further possibility is patches of interengaging, closely spaced flexible projections (in the manner of plastics brush bristles) on the support and on the pieces, in place of the Velcro. Of course, it would be possible to have the entire support surface covered in Velcro, or flexible engagement projections, which would leave the user to use greater ingenuity in deciding exactly where to place the respective pieces to form the final picture/pattern.

Since connection of the pieces by their own mutual interlocking is not longer critical when they are secured to the support surface as aforesaid, the shapes of the pieces need no longer be constrained to inclusion of regular tabs and recesses.

Although the spherical puzzle in Fig.6 is shown with a surface pictorial content depicting a map of the world, may other possibilities exist for pictorial

content. An exhaustive list is not necessary, since the pictorial content is not relevant to the invention as such, and is simply a matter of choice for the designer of a commercial product. However, a few suitable examples which readily spring to mind are:

a plan of the stars in the sky;
a gold fish bowl;
a circus ring;
butterflies, or flowers;
a football.

The surface of the support element might also carry a corresponding pattern or picture to assist the user in correctly placing matching pices thereon, e.g. where the puzzle is used as an educational tool for very young children.

Figs.11 and 18 show other spherical embodiments within the scope of the invention, but based on somewhat different principles of construction to the Fig.6 to 10 embodiment. In this respect the individual jigsaw pieces are still of curved configuration, but instead of overlying the surface of the support element, they project upwardly thereform as a continuation to provide a hollow structure.

As shown in Figs11 to 13, a part-spherical base 131 and top section 132 for a globe are provided, and these may be moulded or otherwise formed. These have around the free edge conventional forms of recesses 134 and/or tabs 133, for interengagement with individual pieces which will form the central (equatorial) band of the overall spherical shape. No inner skin is provided as a foundation for these individual pieces in this particular example. The interlocking of the pieces with each other and with the base and top and the curvature is sufficient to hold the hollow structure together.

A free-standing cylindrical piece 135 is also provided for the base 131 to rest upon.

In other embodiments an inner skin, or a connection rod between the top section 132 and base 131 may optionally be provided.

However, in other embodiments, the top section may be replaced by individual curved pieces, and the base likewise may be formed of several pieces, and the entire structure may still be self-supporting due solely to the interlocking of the curves pieces, as shown in Fig. 18.

To improve stability, where there is no internal

support surface for the individual pieces, additional lugs 136 and interlocking grooves 137 are advantageously provided on the tabs and recesses of the base, top section and individual pieces, as shown clearly in Fig.14.

Alternatively, as shown in Figs.15 to 17 a support tongue or leaf 146 may project from the underside of some or all of the individual pieces and/or the support 131 in the region of each recess 134 to enhance the support of an adjoining piece in the region of its corresponding tab 133.

Many other embodiments of irregular or non-geometric three-dimensional shape (as well as other geometric shapes such as pyramids, hemispheres etc.) are possible within the scope of the invention, using the various general principles and details of construction already outlined. These may be substantially self-supporting, or with basal support, or full underlying surface support, and the pieces may be curved, in one or both directions, or angular, or substantially planar. A certain proportion of block form pieces are also possible.

Some examples of the sort of three-dimensional shapes possible are a teapot, a house, a teddy bear, a

car, a cup and saucer, as shown schematically in Figs.19 to 25. Of course, there are many other possibilities and it is not necessary to provide an exhaustive list.

In the teapot embodiment (Figs. 19 and 20) a connecting support rod 38 is provided internally between a base 41 and a top section 42, and side arms 39 are providing connecting to spout and handle pieces 43, 44 within the overall design. The base 41 carries an imitation jigsaw piece design so as to blend in with the individual pieces mounted above same in the final assembly, which in this case carries a floral design C on its outer surface.

In the house embodiment (Fig.21) a base support of the house 51 and a board 52 similarly carry an imitation jigsaw design. Also in this embodiment only flat pieces and angled pieces are used, the latter forming the corners of the house, walls and roof as indicated at 30 in Fig.21.

In the teddy bear embodiment (Figs.22 and 23) a base support 61 provides the legs, and several intermediate pieces 62 within the design are connected and supported by rods 63, 64, 65.

In the car embodiment (Fig.24) the wheels may each

comprise a single disc, or a plurality of similar segment blocks joined to each other in similar manner to the remainder of the pieces of the puzzle, by tabs and recesses, as indicated by the enlarged single piece and as will be described in more detail later.

In the cup and saucer embodiment (Fig.25), the interior of the simulated object (cup) is exposed showing that it is not necessary to provide a closed shell of pieces.

In all the foregoing differently shaped embodiments, in cases where the individual pieces are self supporting when fitted together, or where they are assembled upwards in self-supporting manner above a base support element, interengagement means in addition to the conventional tabs and recesses are often important to enhance the interengagement of the pieces with the basal support element and/or with each other.

However, such additional interengagement means are not always assential and it is possible that frictional forces between interlocking tabs and recesses of conventional form may be sufficient to maintain a coherent three-dimensional shell.

As regards additional interengagement means, press

fastener means, advantageously in the form of interengageable plugs (or spigots) and apertures may be provided on the tabs and the recesses, respectively (or vice versa). Alternatively fastener means akin to respective projection and reception components of conventional press stud fasteners, as commonly used on clothing, may be employed.

Furthermore, the recesses may take the form of areas of reduced thickness - in effect shallow pits into which the tabs seat - with the apertures provided either in these reduced thickness areas or in the tabs, and the plugs for engagement therein on the corresponding region which is to fit.

An example is shown in Figs.26 to 29 wherein the recesses 72 of the individual jigsaw pieces 70 are not formed as complete cut-outs, but as areas of reduced thickness, specifically where a certain depth of material is effectively removed, so that there is a shallow pit for reception of the corresponding conventional style tab 71, i.e. into which the tab 71 will seat. The tab 71 could correspondingly be of reduced thickness compared to the main body of the piece 70 so as to fit into the pit of the recess 72 and maintain a flush surface with the adjoining piece. Additionally each shallow pit (recess) 72 is provided in

the vicinity of its centre with an aperture 74 and each tab 71 is provided on its under surface with a plug 73 which can be pressed home and firmly retained in the corresponding aperture 74.

An advantage of this relatively simple arrangementis the security of the interlock obtained in the final self supporting assembly.

In cases where there is a basal support element or a top element formed with recesses, e.g. in a spherical assembly as in Figs. 13 or 14, those will preferably also be of the shallow pit style, with apertures to enable secure engagement of the adjacent individual pieces.

As shown in Fig.28, the individual pieces may conveniently be formed with either four tabs or four recesses. Then, at minimum, only two different types, receivers A with recesses 72 and apertures 74 and engagers B with tabs 71 and plugs 73, may be required to be formed.

The individual pieces shown in Fig.28 may be substantially planar or curved in one or two directions.

Fig.29 shows how any equal number of such pieces,

e.g. eight, ten, twelve, may be connected alternatively ABAB etc. to form a segmental part of the final sphere. A ten piece example is shown here, and a fuller example of an entire sphere formed in this way is shown in Fig.18. For production of such a sphere, taking into account the differing curvature in the different layers, only seven tools would be required to mould all the necessary pieces (i.e. there are only seven differently shaped pieces).

Referring back to Figs.24 and 25, these irregular shapes also make use of this type of additional interengagement.

The pieces can be moulded of plastics, as just mentioned, or formed mechanically by bending, pressing, cutting out etc, depending on the type of puzzle, the overall shape of the final assembly, and the materials used.

In other embodiments, represented by example in Figs.30 and 31, on additional interengaging effect can be achieved by the tabs 81 being formed resiliently and of somewhat larger size than the recesses 82 into which they are to fit for assembly of the jigsaw, but with notches 83 (or slots) cut therein from their outer edge regions such that assembly is effected by manually

squeezing the parts of each tab 81 together to close the notch 83 (or slot) so that the tab 81 will fit into the recess 82 and be held under tension therein. In this respect, the two parts press resiliently outwards against the edges of the recess 82. Again, this is a way of enhancing the interlock of the pieces 80 with each other and with any basal support.

In these cases also, the recesses 82 may, as shown, advantageously take the form of areas of reduced thickness (shallow pits) into which the bifurcated tabs (preferably also of reduced thickness) can be fitted, when held under tension.

Naturally, in embodiments which rely on the foregoing manner of additionally securing the pieces together in the assembled puzzle, the pieces must be formed of plastics so that the slotted tabs can have adequate resilience.

Again, the foregoing could be applied to any ultimate shape of assembly.

In yet other embodiments (not illustrated) additional interengageable grooves and lugs or ridgesare provided on the conventional tabs and recesses of the individual pieces (or vice versa) to enhance the

interengagement of the pieces with any basal support element and with each other. Fig.14 actually shows one version of this type of additional interconnection. Many other variants are possible, the essential feature being the mating of the lugs and grooves, whatever their precise configuration or positioning so as to interlock the assembled pieces. The lugs may, for example, be of angular or hook-like form, with the grooves matching thereto, and may have enlargement so as to make a snap fit, held as friction fit in the matching grooves.

In other embodiments within the scope of the invention the individual jigsaw pieces are not of the conventional form with lobe-like tabs and corresponding cut out, or reduced thickness recesses, but are of some other shape such as rectangular, hexagonal, or other polygonal, or even circular. Where there is no underlying support means, on which such pieces can be laid, adhered or releasably attached by magnetism, as discussed in respect of the earlier embodiment shown in Figs 6 to 10, they can still form a self-supporting three-dimensional structure extending up from a basal support by individual interconnection, e.g. by magnetic force.

An example is illustrated in Figs.32 and 33 where

undulating surface, and the curving shape of the the pieces 90 are hexagonal with magnetic strips 91 applied to their edges whereby the assembled pieces are held together in three-dimensional form. The pieces 90 may be curved or planar.

Turning now to Fig.34, this shows a particular modification where an underlying support element has an individual pieces which are to be laid thereupon in surface contact matches that. As previously mentioned, other curving shapes can be envisaged e.g. hemispherical, convex or concave, and all of theses may or may not have such an underlying support surface.

Incidently in the case of an undulating, fully supported configuration as in Fig.34 provision of additional securement means to hold the curving pieces to the support surface (as in Figs. 6 to 10) may not be necessary in cases where the pieces mutually interlock, by conventional tabs and recesses or otherwise.

Turning now to Figs. 35 to 37, these represent one example of a combination of pieces of block form and of leaf or sheet form, at least some with curved or angular surfaces, and either self-supporting, or with some support element, or a mixture of both, being assembled together to form a three-dimensional article.

The example given in Fig.35 is a wheeled unit, but many other embodiments can be devised using a combination of the principles of puzzle construction and the manners of interconnection and attachment of pieces disclosed in the present application.

An enormous number of different shapes and types of piece can be used to assemble three dimensional hollow or solid units (or a combination of hollow and solid portions). Those illustrated by way of example in Figs.38 to 40 have slightly different types of projections and recesses (of shallow pit form) with plugs and apertures, but of course other interconnection means are equally possible. The reference numerals used in Figs.38 to 40 correspond to those used in Figs.2 and 3 for equivalent parts.

With reference to Figs.41 and 42, other embodiments with the scope of the invention comprise puzzle assemblies which form irregular three-dimensional self-supporting structures, without any special support means, and with angular and/or curved pieces interconnected by interengaging tabs and recesses. Where necessary, additional securement means may be provided on the tabs and recesses or elsewhere (e.g. apertures, and plugs for insertion therein, or interengaging hooked portions, adhesive pads etc. as

previously described).

In some cases (as indicated in Fig.42) the tabs 22 may extend at acute or oblique angles relative to the remainder of a piece to enable appropriate orientation of that piece when assembled, to change the direction of the puzzle configuration, and/or to enable more secure attachment to other pieces in the 3-D array. In this way unusual, irregular and sprawling configurations can be constructed. In a boxed game, suggestions may be given for various shapes e.g. tree, starfish, spacecraft etc. which can all be made by different arrangements and combinations of pieces. Alternatively, pictorial matter or indicia on the pieces, or the size and shpae of the respective tabs and recesses may indicate or dictate that the pieces are assembled in only one particular configuration.

As previously mentioned, individual pieces and support elements (if provided) of the various puzzle embodiments may conveniently be moulded from plastics material, or else cut from plastics sheet, if necessary of appropriate initial curvature. However, where the connection method permits, the pieces may in some cases be made from cardboard or fibreboard, or metal, wood or rubber, or indeed any other suitable material.

In some cases, where the pieces are moulded of plastics, they are formed of coloured plastics and no additional surface indicia or pictorial matter are required.

Where pictorial matter is provided on the surfaces of the individual jigsaw pieces and/or the basal support, this may, for a spherical shape, be effected by mercator projection.

Alternatively individual printed pieces carrying pictorial matter and with adhesive on their underside (known as "deckels") may be cut out by the printers together with releasable backing sheets. These would be of equivalent shapes to the jigsaw pieces and may be supplied along with the jigsaw pieces as a kit for attachment by the purchaser.

CLAIMS

1. A jigsaw puzzle assembly comprising a plurality of pieces which are adapted to fit together to provide a three-dimensional structure, at least some of the pieces providing the contour or shell of the structure being of sheet-form.

2. An assembly as claimed in Claim 1 wherein at least some of the sheet-form pieces providing the external contour or shell of the assembled structure are curved in at least one direction.

3. An assembly as claimed in Claim 1 or 2 wherein at least part of the structure formed by the assembled pieces is hollow.

4. An assembly as claimed in Claim 1, 2 or 3 wherein at least some of the pieces are of block-form and have an external surface curving in at least one direction.

5. An assembly as claimed in any preceding claim wherein the structure formed by the assembled pieces is substantially cylindrical.

6. An assembly as claimed in Claim 5 further including an end cap for fitting onto one end of the

final structure, or a pair of end caps for fitting onto respective ends of the final structure.

7. An assembly as claimed in any of Claims 1 to 4 wherein the structure formed by the assembled pieces is substantially spherical.

8. An assembly as claimed in any preceding claim further including a basal element upon which the pieces are supported, the pieces being assembled upwardly of the basal element, which constitutes the lower extremity of the structure.

9. An assembly as claimed in Claim 1 or 2 further including a support element providing a surface upon which the pieces are adapted to be assembled with major surfaces of the pieces in direct overlying relationship thereto.

10. An assembly as claimed in claim 9 wherein releasable attachment means are provided on the support element and/or on the individual pieces so as to retain the pieces in their assembled position overlying the support element surface.

11. An assembly as claimed in claim 10 wherein the attachment means comprises a coating of releasable

adhesive on the surface of the support element.

12. As assembly as claimed in claim 10 wherein the attachment means comprises respective areas of barbed fastener material on the surface of the support element and on the undersurfaces of the respective pieces.

13. An assembly as claimed in claim 10 wherein the attachment means comprises respective areas of interengageable projections on the surface of the support element and on the undersurfaces of the respective pieces.

14. An assembly as claimed in claim 10 wherein the attachment means comprises a magnetic area on the surface of the individual pieces, or vice versa.

15. An assembly as claimed in claim 3 which is substantially self-supporting except for a number of internal supports.

16. An assembly as claimed in any preceding claim wherein the pieces are designed to interlock with each other by means of interengaging tabs and recessed regions.

17. An assembly as claimed in Claim 16 wherein the

pieces are provided with additional interengagement means in the form of projections on the tabs for fitting into recesses in the recessed regions, or vice versa.

18. An assembly as claimed in Claim 16 or 17 wherein the pieces are provided with additional interengagement means in the form of plugs on the tabs for fitting into apertures in the recessed regions, or vice versa.

19. An assembly as claimed in claim 16 or 17 wherein the pieces are provided with additional interengagement means in the form of peripheral lugs or ridges on the tabs for fitting into grooves around the recessed regions, or vice versa.

20. An assembly as claimed in Claim 16 wherein the tabs are resiliently formed and provided with notches to facilitate tighter fitting into the recessed regions.

21. An assembly as claimed in any of the claims 1 to 15 wherein the pieces are provided with magnetic means to enable edge to edge interconnection.

22. An assembly as claimed in any preceding claim wherein the pieces are provided with surface indicia.

23. An assembly as claimed in any preceding claim

wherein the pieces are moulded of plastics.

24. A jigsaw puzzle assembly comprising a plurality of pieces which are adapted to fit together to provide a three dimensional structure, at least some of the pieces being of sheet form and at least part of the structure being hollow.

25. A jigsaw puzzle assembly substantially as hereinbefore described with reference to and as illustrated by any one or any combination of the accompanying drawings.

Published 1990 at The Patent Office, State House, 66-71 High Holborn, London WC1R 4TP. Further copies may be obtained from The Patent Office Sales Branch, St Mary Cray, Orpington, Kent BR5 3RD. Printed by Multiplex techniques ltd, St Mary Cray, Kent, Con. 1/87